Site: Tomato (Page 1)	**Overall Confidence Rating: H**

Background: During 1994-96, there was a mean of 472,000 harvested acres (72% processed[18], 28% fresh). CA, FL, OH, IN, and NY comprised 90% of the acreage[4]. Of the 874,000 acres treated, 17% were treated with organophosphates. Organophosphates were applied approximately 3.1 times per acre per year during the period[5]. Fresh tomatoes were treated much more than processed. CA produced about 95% of the processed and FL produced most of the fresh. The following insecticides have usage, registration, and tolerances[12] for tomatoes.

Organophosphate	% Treated[1]		# Applications		Rate (lb AI/A)		PHI (days)	
Pesticides	Max	Avg	Max[2]	Avg[1]	Max[2]	Avg[1]	Min[2]	Avg
azinphos-methyl[1, 5, 10, 17]	25	15	4[11]	1.5[10]	1.5	0.6[10]	0	7[3a,c]-14[3c,e,u]
methamidophos[1, 5, 10, 17]	Process 11 Fresh 90	Process 9 Fresh 58	5	Process 1.1 Fresh 4.2	1	Process 0.9 Fresh 0.8	7	14[3a]
dimethoate[1, 5, 10, 17]	10	9	2[3]	1.4[10]	0.5	0.5[10]	7	7[3a,c,e]
malathion[1, 5, 10, 17]	9	4	Not specified on labels	2.5	21.6	0.2	1	1[3a]
diazinon[1, 5, 10, 17]	7	4	5	2	11.5	0.4	1	1[3c]-60[3a,t]
chlorpyrifos[1, 5, 10, 17]	4	2	8	1.4	1	Not Available	14	Not Available
methyl parathion[1, 5, 10]	3	1	Not specified on labels	1[3d]	1.5	1[7e]	5	15[3a]
disulfoton[1, 5, 17]	0.1[3a]	0	1	1	3	1.3	30	90[3a]

Confidence Rating: H= high confidence = data from several confirming sources; confirmed by personal experience
M = medium confidence = data from only a few sources; may be some conflicting or unconfirmed info.
L = low confidence = data from only one unconfirmed source

Organophosphate Target Pests for Tomatoes[5]	
Major	aphids (potato, green peach)[6,7a], tomato pinworm; wireworms; whiteflies (silverleaf[7a]); leafminer (*Liriomyza*[7a])
Moderate	flea beetles; cutworm; symphylans; beet leafhopper[7a]; tomato fruitworm; beet armyworm; Colorado potato beetle; fruit flies (*Drosophila*[7a]); crickets
Minor	thrips; stink bugs; lygus bugs

Major = 20+% of all OP usage on pest; Moderate = 5-20% of all OP usage on pest; Minor =<5% of all OP usage on pest

Note: Fonofos, oxydemeton-methyl, dicrotophos, naled[19], and acephate have usage but not tolerances[5, 12].

Sources: (Crop and Pest Summaries)

[1]QUA. 1993-1997. EPA Quantitative Usage Analysis. Methamidophos is the only insecticide for which average numbers of applications and lbs per year are available for fresh and processed; therefore, weighted averages are given for fresh and processed.
[2]LUIS. 1998. Label Use Information System, version 5.0, EPA.
[3a] QUA+, Quantitative Usage Analysis, EPA. California Processing Tomato Industry FQPA Response. 1997. Diazinon and disulfoton were applied at plant.
[3b]QUA+, Quantitative Usage Analysis, EPA. California Tomato Research Institute report to NCFAP. Insecticide Use on California Tomatoes. 1995. Wireworms, potato aphids, and stink bugs listed as major pests in processed tomatoes.
[3c]QUA+, Quantitative Usage Analysis, EPA. Pesticide Use and Usage in Michigan 1997. 1998.
[3e]QUA+, Quantitative Usage Analysis, EPA. Rutgers University, NJ. 1998.
[3f]QUA+, Quantitative Usage Analysis, EPA. Valent. Methamidophos. 1998.
[3g]QUA+, Quantitative Usage Analysis, EPA. Atochem. Methyl Parathion. 1998.
[3t]MI had ca. 2% of acreage and CA 98%[4], so weighted average PHI is 59.
[3u]MI 2%, and CA 98% of the acreage[4], so weighted average PHI is 13.
[4]Agricultural Statistics. USDA. 1998.
[5] Proprietary EPA Quantitative Pesticide Usage. 1997.
[6] Proprietary EPA Quantitative Pesticide Usage. 1997.
[7a]University of California, Pest Management Guidelines, Tomato. 1997.
[7b]University of Florida, 1996 Florida Insect Management Guide, Insect Management in Tomatoes. 1996.
[7c]Ohio Vegetable Production Guide, Tomatoes: Fresh Market and Processing, Insect Control. 1997.
[7d]Purdue University [IN], Management of Insect Pests on Fresh Market Tomatoes. 1993.
[7e]Cornell [NY] Cooperative Extension, Pest Management Recommendations, Control of Insect Pests of Tomatoes. 1998.
[8] Proprietary EPA Quantitative Pesticide Usage. 1996.
[10]Agricultural Chemical Usage Vegetables 1996. USDA National Agricultural Statistics Service. 1997.
[11]Insect Control Guide. Meister Publishing. 1997.
[12]Tolerance Index System. EPA. 1998.
[13]Arthropod Management Tests. Ent. Soc. America. 1997.
[14]Arthropod Management Tests. Ent. Soc. America. 1996.
[15]Arthropod Management Tests. Ent. Soc. America. 1994.
[16]EPA Section 18 records. 1995-1998.
[17]US Geological Survey, Pesticide National Synthesis Project, Tomatoes for 1997. 1998.
[18]Balling, S., Processed Tomato Foundation, 925-944-7377, stated in telephone communication that up to 95% of processed tomatoes produced in CA. 7/8/98.
[19]FR 63:3057-3060. WWW.cas.psu.edu/docs/.
[20] OP Tolerance Assessment Matrix Populating Instructions & Data Dictionary, EPA, 1998.
[21]Rivara, C. California Processing Tomato Industry. Comments on draft. July 17, 1998.
[22]University of California. California Pesticide Use Summaries, Tomato, Tomato (processing/canning) for 1994. 1998.
[23]California Dept. Pesticide Regulation and Univ. California Statewide IPM Program. Pest Management Survey Database. Tomato. 1996.
[24]Agricultural Information Services, Ltd. 1997. World Pest Infestation Database. Tomato, Georgia, North Carolina, California.
[25]www.nass.usda.gov/oh, ny, in. 1997 vegetable production stats. 1998.

Date: 8/3/98

Site: Tomato (Processed)
Region: California

Pest	Organophosphate	Efficacy	Mkt		Class	Alt. Pesticide List	Efficacy	Mkt	Constraints/Notes on Alternatives
Timing: Seedling									
aphid (green peach)[7a] (major)[5]	dimethoate[5]	☺[7a]	med[5]		O	imidacloprid[5]		high[5]	Imidacloprid at plant recommended for whitefly[7a].
	disulfoton[3a]		lo[3a]						
	diazinon[5]		high[5]						
	malathion[5]	❍[7a]	med[5]						
wireworms (major)[3a,5]	diazinon[3a,5]	●[23]-☺[3a]	high[5]						Wireworms major ipm concern in processed production[3a].
flea beetles (moderate)[7a,5]	methamidophos[5]		med[5]		C	carbaryl[7a,3f]	●[23]-☺[7a]	high[5]	Carbaryl on mature fruit to remove flea beetles going for processing[3b]
					CH	endosulfan[23,3f]			
					P	esfenvalerate[5,3f]		high[5]	
symphylan (moderate)[5]	diazinon[3a]	❍[3a]							
cutworm (moderate)[5,7a]	methamidophos[5]		med[5]		C	carbaryl[5,3f]		high[5]	Methomyl plus pyrethroids used for knockdown[3b]
					C	methomyl[5,3f]	●[5]	med[7a]	
					P	lambda-cyhalothrin[5]	●[5]	lo[5]	

ADDITIONAL INFORMATION:
Note: Over 95% of seedlings are for processing tomatoes. Analyzed pests make up >95% of OP usage.
Observations: There are no IGRs or biologicals registered. Pyriproxifen, buprofezin, and spinosad are in the pipeline currently through Sec. 18. Major pests drive OP usage; moderate and minor pests could become major if resurgence occurs. There are no alternatives for diazinon for the soil pests wireworms and symphylans.

SOURCES: See crop summary.

Date: 6/24/98

Pest Importance: Major = 20+% of all OP usage on pest; Moderate = 5-20% of all OP usage on pest; Minor = <5% of all OP usage on pest
Efficacy Rating: Excellent = ☺ Good = ❍ Fair = ●
Market Share: High = use of OP represents 20+% of all insecticide usage on pest; Med = 5-20% of all usage on pest; Lo = <5% of all usage on pest
Insecticides: C = Carbamates; P = Pyrethroids; CH = Chlorinated Hydrocarbons; IGR = Insect Growth Regulators; B = Biological; O = Other pesticides

Site: Tomato (Processed)
Region: California

Pest	Organophosphate	Efficacy	Mkt		Class	Alt. Pesticide List	Efficacy	Mkt	Constraints of Alternatives
Timing: Foliage/fruit									
aphid (potato)[7a] (major)[5]	disulfoton[5]		low[5]		P	permethrin [5]		low[5]	Dimethoate hard on beneficials and nontargets[23]
	dimethoate[3b,5]	☺[7a]	high[5]		C	oxamyl [5]	❍[7a]	med[5]	Dimethoate only effective treatment for the pest[3b]
	diazinon[5]	●[7a]	low[5]		O	imidacloprid [5]	●[7a]	low[5]	
	malathion[5]	❍[7a]	med[5]		O	insecticidal soap[5]	❍[7a]	low[5]	
	methamidophos[5]		med[5]		CH	endosulfan[5,3f]	❍[7a]	low[5]	
	azinphos-methyl[5]		med[5]		B	rotenone[5]		med [5]	
	chlorpyrifos[5]		low[5]		C	carbaryl[5,3f]		low[5]	
					P	esfenvalerate[5,3f]		low[5]	
beet leafhopper[7a] (moderate)[5]	methamidophos[5]	●[3a]	high[5]		C	carbaryl[7a]	☺[7a]		
	azinphos-methyl[5]	●[3a]	high[5]		O	imidacloprid[5]		low[5]	
	dimethoate[5]	●[5]	high[5]		P	esfenvalerate[5]		low[5]	

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Site: Tomato (Processed)
Region: California

Pest	Organophosphate	Efficacy	Mkt		Class	Alt. Pesticide List	Efficacy	Mkt	Constraints of Alternatives
Timing: Foliage/fruit									
stink bugs (minor)[3]	methamidophos[5]	☺[3b]	high[5]		P	esfenvalerate[7a,3f]	❍[7a]	med[5]	Noted (sporadic but increasing[24]) IPM pest in CA; methamidophos only effective control for it[3b]. Esfenvalerate tank mixed with methomyl.[7a] Dimethoate & methamidophos hard on beneficials and nontargets and methamidophos undesirable residues[23] Spinosad is effective methomyl alternative[13].Imidacloprid good residual activity[23]
	dimethoate[7a]	❍[7a]-☺[24]			C	carbaryl[7a,3f]		low[5]	
					CH	endosulfan[7a,3f]	☺[7a,24]	low[5]	
					O	imidacloprid[7]	●[7a]		
					O	insecticidal soap[7]	●[7a]		
					C	methomyl[7]	❍[7a]		
lygus bugs (minor)[5]	dimethoate[5]	❍[7a]	high[5]		C	methomyl[3f,5]		med[5]	Spinosad is good methomyl alternative[13] Dimethoate hard on beneficials and nontargets[23] Dimethoate hard on beneficials and nontargets[23] D
	methamidophos[5]		med[5]		P	bifenthrin[5]		low[5]	
					CH	endosulfan[7a,3f]	☺[7a]		
					P	fenpropathrin[7a]	●[7a]		
leafminers, *Liriomyza*[7a] (moderate)[5]	methamidophos[5]		med[5]		O	abamectin[5,7a]	☺[7a]	med [5]	Methamidophos hard on beneficials and nontargets and has undesirable residues[23] Natural biocontrol parasitoids vary in effectiveness[23]. Dimethoate hard on beneficials and nontargets[23]
	diazinon[5]		high[5]		C	oxamyl[5,7a]	❍[7a]	high[5]	
	dimethoate[5]		high[5]		P	esfenvalerate[7a]	❍[7a]	low [5]	

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Site: Tomato (Processed)
Region: California

Pest	Organophosphate	Efficacy	Mkt		Class	Alt. Pesticide List	Efficacy	Mkt	Constraints of Alternatives
Timing: Foliage/fruit									
tomato pinworm (moderate)[5]	azinphos-methyl[5]		high[5]		O	tredecen acetate pheromone[7a]	☺[7a]		Methomyl killed off leafminer biocontrol agents and increased populations of leafminer[13]; induces secondary pests[23]
	methamidophos[5]		low[5]		C	methomyl[7a]	●[23]-❍[7a]	med [5]	
					P	esfenvalerate[7a]	❍[7a]	high[5]	
					B	*Bacillus thuringiensis*[5]		med [5]	
					C	oxamyl[5]		high [5]	
tomato fruitworm (moderate)[5]	malathion[5]		low[5]		P	esfenvalerate[5]	☺[7a]	high [5]	Esfenvalerate caused secondary outbreak mites, leafminers[7a]. Methomyl may induce secondary pests[23]
	diazinon[5]		low[5]		C	methomyl[5]	❍[7]	med [5]	
	methamidophos[5]		low[5]		O	*Bacillus thuringiensis*[5]	●[23]-❍[7a]	high [5]	Methamidophos hard on beneficials and nontargets and has undesirable residues [23]
					O	abamectin[5]		low [5]	
					C	carbaryl[5]	❍[7a]	low [5]	
					B	*Trichogramma* wasp egg biocontrol	●[23]		Carbaryl effective late season[7a]. Carbaryl hard on beneficials and nontargets[23]
					O	cryolite[5]		low [5]	
					O	insecticidal soap[5]		low [5]	Wasps for supression are very specific[7a]

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Site: Tomato (Processed)
Region: California

Pest	Organophosphate	Efficacy	Mkt		Class	Alt. Pesticide List	Efficacy	Mkt	Constraints of Alternatives
Timing: Foliage/fruit									
whitefly (green-house and silverleaf)[7a] (moderate)[5]	methamidophos[5]		high[5]		O	imidacloprid[5]	☺[7a]	low [5]	Tomato yellow leaf curl virus not yet in CA[7a], when it is, preplant imidacloprid will likely have major usage.
	dimethoate[5]		high[5]		C	oxamyl[5]	❍[7a]	low[5]	
	diazinon[5]		med[5]		O	insecticidal soap[5]		low[5]	
					O	rotenone[5]		low[5]	
					P	pyrethrin[5]		low[5]	

ADDITIONAL INFORMATION:

Note: Analyzed pests make up >95% of OP usage.

SOURCES: See crop summary.

Date: 6/24/98

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